

Neonatal mortality rate in Iran: the Iranian Perinatal Mortality Surveillance System

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Abstract

Background: Neonatal mortality is the major proportion of children mortality under five years and it is considered as the main health indicator in the first year of life. This paper has aimed to review the neonatal mortality in the numbers recorded at the Iranian Perinatal Mortality Surveillance System (IPMSS) by Iran Ministry of Health and Medical Education.

Methods: A descriptive study was done in 2014. For assessment of sampling quality and quantity, 24 hospitals randomly were selected. Recorded information, related to perinatal mortality (deaths from 22 completed weeks of gestation until 30 completed days after birth inclusive of stillbirths and neonatal mortality) from selected hospitals, was compared with recorded data in IPMSS.

Results: Results showed that, out of 1,725 perinatal deaths occurred in hospitals, 1,480 (85.80%) deaths were recorded in IPMSS. Of 1,041 neonatal deaths that occurred in hospitals (in hospital wards and delivery rooms), 875 (84.05%) were in IPMSS. It shows that a correction coefficient for hospital neonatal mortality was 1.1904. Based on analyzing process, correction coefficients for stillbirth reported by hospitals, stillbirth for all over the country and perinatal death were 1.130, 1.1775 and 1.2443, respectively. Considering these correction coefficients – that enabled to calculate 15,130 neonatal deaths – and 1,421,689 live births (according to Statistics Center) in 2012, neonatal mortality rate was 10.64 in 1,000 live births.

Conclusion: Our data showed some problems in the registration system. Although implementation and supervision of such Surveillance System are not easy, they are essential and provide valuable data in perinatal audit and neonatal health care practices.

Keywords

Neonatal mortality rate, stillbirth, perinatal mortality, Perinatal Mortality Surveillance System, Registry System, Iran.

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Introduction

Neonatal mortality is the major proportion (40%) of children mortality under 5 years and it is considered as the main health and development indicator in the first year of life. It is supposed that the present gap in reported mortality rates may relate to severity of diseases or management status rather than to the incidence rate in different countries [1, 2].

Based on UNICEF reports, children mortality rate before 5 years in Iran had been 56 per 1,000 live births in 1990 and 18 per 1,000 live births in 2012. The rates in the first year of life were reported to be 44/1,000 and 15/1,000 in 1990 and 2012, respectively. WHO report also indicated that neonatal mortality rate in Iran has been decreasing from 19 to 11 per 1,000 live births from 2004 to 2012 [3-5] and, according to the burden of disease and injury in Iran, the neonatal mortality was 92% in hospitals, 8% out of hospitals. Extraction data from the National Organization for Civil Registration for perinatal mortality in our country may be unreal and challenging regarding to its quality and quantity. This type of biostatistics data may be incomplete and biased. For instance, there are fewer tendencies to record number of neonates and children's deaths in comparison to adults' deaths in some areas; the death of a neonate may not be recorded unless there are some benefits such as inheritance. Because of this shortcoming, the Neonatal Health Office of Iran Ministry of Health and Medical Education drafted and launched health policies for the Iranian Perinatal Mortality Surveillance System (IPMSS, hospital-based), which have been promoted and enhanced until now. IPMSS was installed in

2010. Three questionnaires were designed to identify information related to neonatal death or stillbirth. Staffs of delivery room or neonatal wards were asked to fill in the questionnaires correctly. All perinatal mortality (under 30 days) that happened in hospitals affiliated to 45 universities of medical sciences were recorded in IPMSS. In the present study, we gathered information related to the number of registered perinatal deaths from some selected hospitals and compared it with the numbers recorded in IPMSS. Moreover, based on recorded data and calculated correction coefficient for perinatal mortality, the rate of neonatal mortality and its correlated indicators were determined.

Materials and methods

A descriptive study was done in 2014. The inclusion criteria were recorded neonatal deaths (deaths during the first month of life, because deaths of children between 1 and 59 months of age are registered in the Child Mortality Surveillance System) and stillbirths in 2012 and the exclusion criteria were neonatal deaths with birth weight under 250 g, and missing or incomplete data. Perinatal mortality considered deaths occurred after 22 weeks of gestation (154 days) and until 30 days after birth. Each case with related variables (including type of hospital, ward, day of death...) were encoded, labeled and their values were determined. Of 21,694 perinatal mortality audit in IPMSS files in 2012, 1,323 cases were excluded because of missing or duplicate data. Among 20,371 deaths, 11,693 happened in the neonatal period and 8,678 had been considered as stillbirths. For quality and quantity assessment of IPMSS, by estimating 15% of undercount in the IPMSS, 95% confidence intervals and an alpha error of 0.02, a sample size was determined (1,225 cases). Finally, 24 hospitals were randomly selected and 1,480 deaths recorded in IPMSS files entered the study, of which 875 were neonatal deaths and 605 were stillbirths. Staffs of hospital statistical departments were asked to correctly fill in the questionnaires.

In **Tab. 1** detailed data are shown:

- number of cities and hospitals;
- recorded common neonatal deaths in both lists (IPMSS and reported by hospitals);
- recorded deaths in each list;
- real number of deaths including common deaths in both lists and non-shared deaths.

Recorded information from selected hospitals was compared with recorded data in the IPMSS.

Table 1. Frequency of perinatal mortality in selected hospitals in 2012 (24 hospitals in 18 cities).

	Real	Only in one list		Common
		H	IPMSS	
Neonatal mortality and stillbirths	1,725	1,606	1,480	1,367
Neonatal deaths in wards	793	744	642	593
Neonatal deaths in labor	248	202	233	187
Stillbirths	684	660	605	598

H: reported by hospitals (statistics and information unit); IPMSS: recorded in the Iranian Perinatal Mortality Surveillance System.

Moreover, based on the results and calculated correction coefficient for perinatal mortality, the rate of neonatal mortality and its correlated indicators were determined. All statistical analyses were performed using the statistical package SPSS® version 21. This study was taken from a medical thesis presented to Shahid Beheshti University of Medical Sciences (ID 262).

Results

Results showed that of 1,725 perinatal deaths occurred in the 24 randomly selected hospitals, 1,480 (85.80%) deaths were recorded in IPMSS. Of 1,041 neonatal deaths occurred in hospitals (in hospital wards and delivery rooms) 875 (84.05%) were recorded in IPMSS. Data shows that the correction coefficient for hospital neonatal mortality is 1.1904.

Tab. 2 shows correction coefficients for the extension of the results on neonatal mortality (numbers reported by hospitals and recorded in the IPMSS) to total neonatal mortality in Iran. According to correction coefficients, neonatal mortality data in Iran were corrected as follows:

- neonatal mortality occurred in hospitals and recorded in IPMSS: 11,693 (84.05%);
- neonatal mortality occurred in hospitals and not recorded in IPMSS: 2,226 (15.95%);
- total neonatal mortality in the hospitals: 13,919 (92%);
- neonatal mortality out of the hospitals: 1,211 (8%).

Table 2. Correction coefficients for the extension of the results on neonatal mortality.

Extension of neonatal deaths recorded in IPMSS to total neonatal deaths occurred in hospitals in Iran	Extension of neonatal deaths reported by hospitals to total neonatal deaths (in and out of hospitals) in Iran	Extension of neonatal deaths recorded in IPMSS to total neonatal deaths (in and out of hospitals) in Iran
1.1904	1.0870	1.2939

Considering these correction coefficients – that enabled to calculate 15,130 total neonatal deaths (i.e. in and out of hospitals) – and 1,421,689 live births (according to Iran Statistics Center) in 2012 [6], neonatal mortality rate was 10.64% (**Tab. 3**).

Based on the analyzed process, correction coefficients for intrahospital stillbirths, stillbirths and perinatal mortality for all over the country were 1.130, 1.1775 and 1.2443, respectively. Perinatal mortality before and after correction is reported in **Tab. 3**. Results showed that mortality rate among low birth weight neonates (birth weight < 2,500 g) was 81.71 per 1,000 live births. Moreover 76.30% of dead neonates were low birth weight (**Tab. 4**).

Discussion

Based on the results, neonatal mortality in 2012 was 15,130. The frequency reported by the United Nations in 2010, 2012 and 2013 were 18,000, 16,000 and 15,000, respectively [7-9]. However, in our study the neonatal period was considered within the first 30 days of life not within the first 28 days. In this study the neonatal mortality rate in Iran in 2012 was calculated as 10.64 in 1,000 live births. It changed to 10.53 in 1,000 live births when we considered all recorded live births plus number of immediate deaths after live births (with no birth certificates). In accordance to our results, UNICEF reported neonatal mortality rate in Iran in 2012 as 11 in 1,000 live births [4, 5]. This rate in our country seems comparable with other statistics in the world; globally neonatal mortality rate was 21 per 1,000 live births in 2012 and in Eastern Mediterranean Region (EMRO) was 26 in 1,000 live births [4]. On the other hand “MIDHS – Demographic and Health Survey Round 2010 – Iran” reported a higher rate (15.29 per 1,000 live births) [10]. The result showed that perinatal mortality rate (neonatal mortality under the age of 28 days and fetal mortality at 20 weeks or more in 1,000 births) in our country in 2012 was 17.70 in 1,000 births. This rate is lower

Table 3. Perinatal mortality before and after correction.

Frequency of deaths and indicators in 2012	Source data – IPMSS	After removing missing and duplicate numbers		
		Hospital numbers before correction	Hospital numbers after correction	Total numbers (in and out of hospitals) in Iran after correction
Frequency of recorded perinatal deaths in hospitals in Iran	21,694	20,371	23,725	25,348
Perinatal mortality rate	15.78	14.83	17.26	17.70
Frequency of neonatal deaths	12,352	11,693	13,919	15,130
Neonatal mortality rate	9.05	8.56	9.79	10.64
Frequency of stillbirths	9,313	8,678	9,806	10,218
Stillbirth rate	6.824	6.358	6.897	7.187

Table 4. Indicators and calculated ratios (based on data registered in Iranian Perinatal Mortality Surveillance System [IPMSS]).

Basic indicators	%
Mortality rate of low birth weight neonates (< 2,500 g)	81.71
Proportion of low birth weight mortality (< 2,500 g)	76.30
Proportion of extremely low birth weight mortality (< 1,000 g)	35.84
Annual mortality rate due to perinatal causes in Iran's hospitals	6.37
Annual mortality rate due to congenital and chromosomal abnormalities in Iran's hospitals	1.70
Annual neonatal mortality rate due to accidents in Iran's hospitals	0.1

than what other investigations indicated; perinatal mortality rates in 27 provinces of Iran in 2004 and in 29 provinces in 2005 were reported to be 18.3 and 18.9 in 1,000 births [11]. Based on WHO report, perinatal mortality rate in Iran in 2000 was 30 in 1,000 births (latest perinatal data for Iran) [12]. This rate in the United State was 10.49 in 1,000 births [13]. We found that, considering the perinatal deaths occurred in hospitals, 85.80% of them were recorded in IPMSS, and it shows a need for capable and efficient registration system in our hospitals. It was observed that in many hospitals staff with lack of skills and information was responsible for recording data related to mortality rates. We think it is a must for personnel in this field to have enough competencies and be familiar with the system, and we think that training courses should be provided. Special consideration for recording the date of death seems necessary so

nothing would be missed; the exact time of death (hour and minute), day, month and year should be recorded in separate boxes in registration forms. In addition to causes of death, mothers' gravidity and pregnancies interval should be exactly defined. For better results adequate supervision programs should be implemented; monthly/seasonal routine or random monitoring are strongly suggested. Evaluation of level of hospitals as well as human factors improves quality of registry services. Acceptable skills and negative practices of staff should be reinforced and corrected, respectively. To achieve the United Nations Millennium Development Goal by 2025, we must work hard. Decline of the preventable causes of neonatal mortality by improving the quality of clinical care, use of technologic equipment in all NICUs, and implementing obstetrics risk management strategies would be achievable.

Conclusion

Our data showed some problems in our perinatal mortality registration system. Although implementation and supervision of such surveillance system are not easy, they are essential and provide valuable data in perinatal audit and neonatal health care practices.

Declaration of interest

The Authors declare that they have no competing interests.

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